

WHAT IS CLAIMED IS:

1. An apparatus comprising:
a cache of traces, each trace including information about interdependent instructions among which data dependency exists, the interdependent instructions including a criterion instruction that is part of a program sequence.
2. The apparatus of claim 1 wherein the information comprises a directed acyclic graph.
3. The apparatus of claim 1 wherein the trace includes pointers to the interdependent instructions.
4. The apparatus of claim 1 wherein the trace includes the interdependent instructions.
5. The apparatus of claim 1 wherein the interdependent instructions include the criterion instruction and instructions preceding the criterion instruction in the program sequence.
6. The apparatus of claim 1 wherein the interdependent instructions are classified into subslice types, the trace including a pointer to each subslice that is formed by each type of the interdependent instructions.
7. The apparatus of claim 6 wherein each subslice is stored as dependent pieces.

Cont
AY

1 8. The apparatus of claim 1 wherein the information
2 includes a triggering condition of the trace, the interdependent
3 instructions of the trace being executed when the triggering
4 condition is met.

1 9. The apparatus of claim 8 wherein the triggering
2 condition includes a triggering instruction in the program
3 sequence, the triggering condition being based on evaluation of
4 an architectural state.

1 10. The apparatus of claim 8 wherein the triggering
2 condition includes a triggering instruction in the program
3 sequence, the triggering condition being based on evaluation of
4 a micro-architectural state.

1 11. The apparatus of claim 1 wherein the information
2 further includes a confidence metric of the trace that predicts
3 the likelihood of producing a correct result from executing the
4 trace.

1 12. The apparatus of claim 11 wherein the confidence
2 metric of the trace indicates whether or not the trace should be
3 replaced by a new trace storing information about different
4 instructions.

AY 1 13. The apparatus of claim 11 wherein the confidence
2 metric of the trace indicates whether or not the trace should be
3 rebuilt using new information about the criterion instruction
4 that arrives at the trace cache.

1 14. The apparatus of claim 11 further comprising a counter
2 having a counter value that indicates the number of times the
3 trace has been executed, the counter value, when exceeding a
4 frequency threshold of the trace, triggering the trace to be
5 rebuilt.

1 15. The apparatus of claim 1 wherein traces that are
2 independent of each other and adjacent in the program sequence
3 are grouped into a very-long-instruction-word for parallel
4 executions.

1 16. The apparatus of claim 1 wherein traces that are data
2 dependent of each other are chained together for serial
3 executions.

1 17. The apparatus of claim 1 further comprising an
2 instruction pointer that indexes the trace, the instruction
3 pointer pointing to a first instruction or a last instruction of
4 the interdependent instructions.

A4
1 18. The apparatus of claim 1 further comprising:
2 a main pipeline executing the program sequence; and
3 at least one secondary pipeline disjoint from the main pipeline
4 executing the interdependent instructions.

1 19. The apparatus of claim 1 wherein the interdependent
2 instructions are executed by a secondary thread on a pipeline,
3 and the program sequence is executed by a main thread on the
4 same pipeline.

1 20. A method comprising:
2 identifying a criterion instruction incurring latency in a
3 program sequence;
4 capturing the criterion instruction and instructions
5 preceding the criterion instruction in the program sequence, the
6 preceding instructions and the criterion instruction being
7 interdependent; and
8 storing a trace in a trace cache, the trace including
9 information about the criterion instruction and the preceding
10 instructions.

1 21. The method of claim 20 wherein the information is in a
2 form of a directed acyclic graph

1 22. The method of claim 20 wherein the latency includes a
2 long latency that exceeds a predetermined time threshold, a
3 frequent latency that exceeds a predetermined recurrence

4 threshold, or a long and uncertain latency that exceeds a mean
5 threshold and a variance threshold.

1 23. The method of claim 20 further comprising dynamically
2 identifying the criterion instruction based on information
3 derived from previous executions.

1 24. The method of claim 20 further comprising capturing
2 the criterion instruction and the preceding instructions by a
3 buffer.

1 25. The method of claim 20 further comprising locating an
2 existing trace in the trace cache before storing the trace, the
3 existing trace and the trace to be stored having the same first
4 instruction or the same last instruction.

1 26. The method of claim 20 further comprising rebuilding
2 the trace after a duration of time interval that grows each time
3 the trace is rebuilt until the duration reaches a predetermined
4 time limit.

1 27. The method of claim 20 further comprising storing, in
2 an array, the information about the criterion instruction and
3 the preceding instructions.

A4

1 28. The method of claim 27 wherein the array further
2 includes a subslice type for each of the instructions, the
3 subslice type being a result of classifying the instructions.

1 29. A computer program residing on a computer readable
2 medium comprising instructions for causing a computer to:

3 identify a criterion instruction incurring latency in a
4 program sequence;

5 capture the criterion instruction and instructions
6 preceding the criterion instruction in the program sequence, the
7 preceding instructions and the criterion instruction being
8 interdependent; and

9 store a trace in a trace file, the trace including
10 information about the criterion instruction, the preceding
11 instructions, and interdependency among the criterion
12 instruction and the preceding instructions.

1 30. The computer program of claim 29 wherein an analysis
2 window defined in the computer program causes the computer to
3 capture the criterion instruction and preceding instructions.

1 31. The computer program of claim 29 wherein the computer
2 identifies the criterion instruction by profiling the program
3 sequence.

Add
A4